DOCUMENT RESUME

ED 313 227 SE 051 036

AUTHOR Duncan, Jim
TITLE Practical Math Skills: Situations--Strategies--Solutions. Intermediate Level. Grades 4-5-6.
REPORT NO ISBN-0-86653-465-2
PUB DATE 89
NOTE 68p.; For the Junior High level, see SE 051 037.
AVAILABLE FROM Good Apple, Inc., Box 299, Carthage, IL 62321-0299 (GA1070, $6.95).
PUB TYPE Guides - Classroom Use - Materials (For Learner) (051) -- Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Computation; Elementary Education; *Elementary School Mathematics; Intermediate Grades; *Mathematical Applications; Mathematical Concepts; *Mathematical Enrichment; Mathematics Education; *Mathematics Materials; *Mathematics Skills

ABSTRACT

This material is a supplement to existing mathematics programs for young learners. The activities presented are based on assumptions about the young problem solver which are difficult to address in standard mathematics texts. In these pages it is assumed that each learner brings to the problem-solving effort a very personal experience base and a unique repertoire of approaches, strategies, and evaluative behaviors for solving problems. It is also assumed that true problem solving is not so much a search for the appropriate rule or algorithm, but rather a response to a personal inquiry characterized by exploration and discovery. Units include: (1) "The Corner Store"; (2) "The Track Meet"; (3) "The Construction Site"; and (4) "The Service Station." Answer keys and objectives for activities are provided. (YP)

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INTERMEDIATE

A Good Apple Math Book for Grades 4-5-6

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Practical MATH SKILLS

Situations—Strategies—Solutions

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PRACTICAL MATH SKILLS

Situations — Strategies — Solutions

Intermediate Level

by

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ISBN No. 0-86653-465-2

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Description of Kino Learning Center

Kino Learning Center is a private, nonprofit elementary and secondary school founded in Tucson, Arizona, in 1975 by parents seeking a futuristic learning model for children. The school not only emphasizes the conventional skills of reading, writing and computing, but goes beyond these basics to the contemporary skills of choosing, relating, valuing, creating and learning how to learn.

Within the prepared environment of the school, each student is free to choose from worthwhile options, a sequence of activities unique to his/her needs and experiences, and in which he/she finds success, interest and pleasure. Each student is free to develop in the way and at the pace appropriate to his/her needs, abilities and interests. The school places special emphasis on individual discovery, on firsthand experience and on creative work.

At Kino Learning Center, adults, teenagers and children mutually engaged in the learning process are continually in the process of changing and growing, for to learn is to change. And to experience joy in learning is to delight in life itself, for learning and life are one.

The curriculum at Kino Learning Center consists of teacher-made learning packets containing facts, processes and values related to topics of interest to the students. These learning packets have been expanded into workbooks for use by teachers and students throughout the United States and Europe. Over thirty books are presently in circulation. The profits from the sale of these books are used to enhance the learning environment at Kino Learning Center.

Acknowledgements

I extend appreciation to Judy Bisignano for editing this book, Sandy Webb for typing the manuscript and Darcy Tom for bringing my words to life through her illustration of the students at Kino Learning Center. I also thank Raul Sanchez and the management of Lucky Food Store for assisting with the illustrations for The Corner Store and Phil Sanford of Buck's River Road Exxon for the illustrations of The Service Station. Most importantly, I thank Becky, Ashley and Charlie for sacrificing weekend fun for the advancement of mathematics for young people.

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Introduction

Practical Math Skills is a supplement to existing mathematics programs for young learners. The activities presented are based firmly on assumptions about the young problem solver which are difficult to address in standard mathematics texts. In these pages it is assumed that each learner brings to the problem-solving effort a very personal experience base and a unique repertoire of approaches, strategies and evaluative behaviors for solving problems. It is also assumed that true problem solving is not so much a search for the appropriate rule or algorithm, but rather a response to a personal inquiry characterized by exploration and discovery.

A quick check of the answer key shows that many answers are expected to vary. Student performance of these activities must therefore be evaluated with an emphasis on process rather than answers. Solving problems is often like that.

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UNIT ONE:
THE CORNER STORE

Do you know:

How the storekeeper earns a living?

What mathematics the storekeeper uses each day?

Why things cost what they do?

How mathematics can help you be a better shopper?

Before you can see and solve problems about buying and selling, you must understand the things that go on in a store. The best way to do this is to go to a store and look around. Watch the storekeeper and the shoppers. Notice all the different ways numerals provide information and all the different ways people use this information.

Look at the picture carefully. Young Sammy Morris is buying some things from Mr. James Clark, the storekeeper. Both are using mathematics.

Tell about the math you see in the picture.

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Shopping at a Store

When you go to a store, you trade something you have for something the store has to sell.

1. What is it that you trade? _____

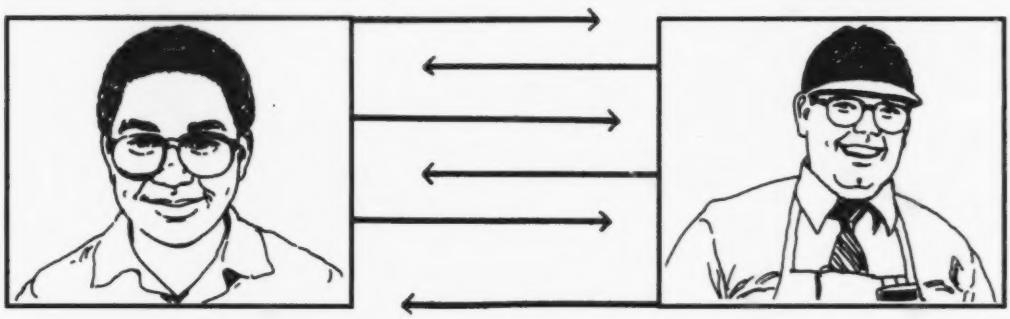
2. What is it that a store might trade? _____

Here are the actions that usually go on between you and a storekeeper.

a. checking the total
b. adding the cost of the items
c. comparing the cost of items
d. making change
e. calculating sales tax
f. counting money

3. Put these actions into correct sequence. Write the corresponding letters on the lines next to Sammy and Mr. Clark.

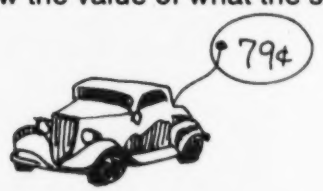
Sammy Mr. Clark



4. How do you know the value of what you have to trade? What is the value?

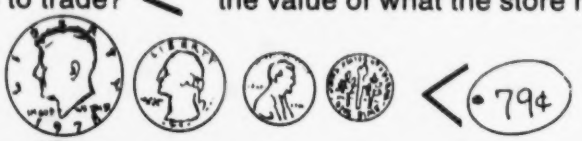
_____

5. How do you know the value of what the store has to trade? What is the value?



_____

6. What happens when the value of what you have > the value of what the store has to trade? < the value of what the store has to trade?

a. 

_____

b.

_____

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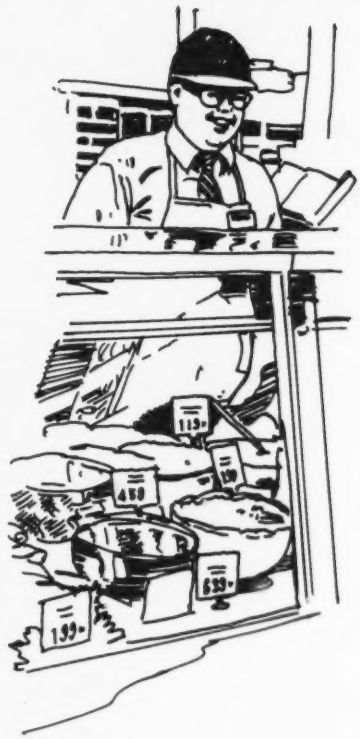
Interviewing a Storekeeper



Storekeeper _____

Position _____

Store _____

Date _____

Interviewer _____

Invite a storekeeper to visit your class. Ask this person the following questions. Write the responses in the spaces below.

1. What types of work do you do in the store?

_____

_____

2. How do you use mathematics in your work?

_____

_____

3. What is an example of a math problem that you solve frequently?

_____

_____

4. What is the hardest math problem you've solved recently?

_____

_____

5. In the time that you've worked here, what new ways have you learned to use math?

_____

_____

6. How do other workers in the store use mathematics on a daily basis?

_____

_____

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Simplifying Problems

Mr. Clark has [16] cans of vegetables on each of △11△ shelves in his store. He also has (55) cans in his storage room. How many cans does he have in all?

Mr. Clark has [3] cans of vegetables on each of △2△ shelves in his store. He also has (6) cans in his storage room. How many cans does he have in all?

Notice that the structure of the two problems is the same. The problems work the same way. This is because the numbers in a problem do not change the way a problem is worked.

If the problem containing the small numbers seems easier to understand, then you have discovered a strategy which may help you solve more difficult problems. Make the problem easier to understand by changing large numbers to small ones. Once you understand how a problem works, you can solve it with any numbers.

Discover the structure of the following problems. Then change the small numbers to big ones and work the problem the same way again.

1. Sammy has [5] pennies. He has △3△ times as many nickels as pennies. How many nickels does he have?

5 x 3 = _____

2. Sammy has [ ] pennies. He has △ △ times as many nickels as pennies. How many nickels does he have?

_____ x _____ = _____

3. Sammy has [2] pennies. He'd like to have △6△ pennies. How many more pennies does he need?

6 - 2 = _____

4. Sammy has [ ] pennies. He'd like to have △ △ pennies. How many more pennies does he need?

_____ - _____ = _____

5. Mr. Clark can put [4] cans on each of his △3△ shelves. Unfortunately he has only (8) cans. How many more cans will Mr. Clark need to fill the shelves?

(4 x 3) - 8 = _____

6. Mr. Clark can put [ ] cans on each of his △ △ shelves. Unfortunately he has only ◯ cans. How many more cans will Mr. Clark need to fill the shelves?

(_____ x _____) - _____ = ___

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Solving Problems

Manipulatives are small movable objects that can help you act out and solve problems. Cut out the manipulatives at the bottom of the page. Use these manipulatives to solve the problems.

1. Sammy has 6 pennies. Mr. Clark gave him 3 more pennies. How many pennies does Sammy have now? _____
2. Sammy has 9 pennies. 6 are shiny. The others are dull. How many pennies are dull? _____
3. Sammy has 4 pockets in his pants. There are 3 pennies in each pocket. How many pennies does Sammy have? _____
4. Sammy has 12 pennies. He puts the same number of pennies into each of the 4 pockets in his pants. How many pennies are in each pocket? _____
5. Sammy has 12 pennies and 4 nickels. He has how many times as many pennies as nickels? _____
6. Sammy has some pennies. He gave 5 to Mr. Clark. Sammy then had 6 pennies left. How many pennies did Sammy have to begin with? _____
7. Sammy has 4 pennies. He has 3 times as many nickels as pennies. How many nickels does he have? _____
8. Sammy had some pennies. After Mr. Clark gave him 8 more, Sammy had 11 pennies. How many pennies did Sammy have to begin with? _____
9. Sammy has 9 pennies. He would like to have 12 pennies. How many more pennies must he get? _____
10. Sammy has 6 pennies. Mr. Clark has twice as many pennies as Sammy. How many pennies does Mr. Clark have? _____

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Making Change

Change is the money you receive from the storekeeper if you give him more money than the selling price of an item.

Read the story. Draw the change Sammy received in the space provided.

Sammy said, "Here's my money, Mr. Clark. I'd like to buy this candy bar."
"Fine," said Mr. Clark. "That candy bar sells for 53¢. Here's your change: 54, 55, 65, 75, one dollar."
"Thank you, Mr. Clark," said Sammy.

1. What can you say about the change Sammy received? _____

_____

_____

Mr. Clark worries that he might run out of coins and not be able to make change for his customers. To help make sure that this does not happen, Mr. Clark follows a rule whenever he counts change. The rule is: "Always use the fewest coins possible when making change."

2. Use Mr. Clark's rule to make change in the following situations. Draw the change in the space provided.

	Cost of Item	Amount Received by Storekeeper	Exact Change to Customer
Example:	$ .64	$ .75	1¢ 10¢
a.	$ .97	$1.25	
b.	$2.45	$3.00	
c.	$ .16	$ .50	

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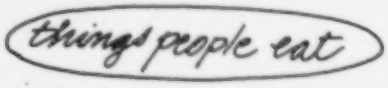
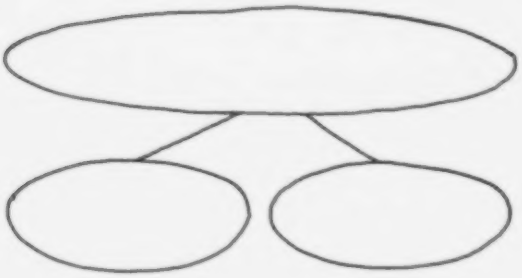
Grouping Inventory

The inventory is all the items that a store has to sell at any given time.

1. Group the inventory of the store into one category.

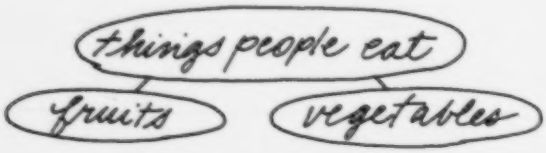
   Example:

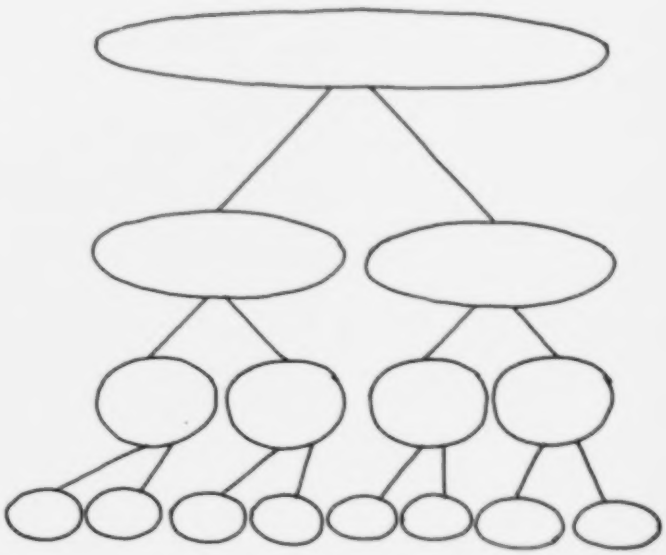




2. Divide the major category into two sub-groupings.

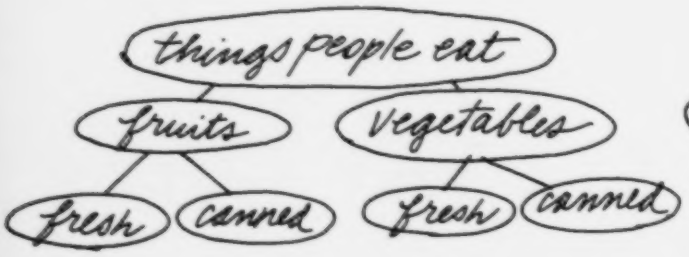
   Example:





3. Continue to divide the categories into sub-groupings.

   Example:



4. Ask a question about inventory in the space below. Later on you will learn how to research and answer this question.

   Example: Which category of inventory contains the most items?

   _____

   _____

   _____

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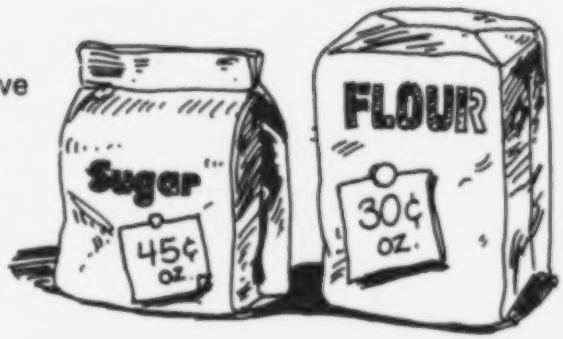
Challenging Math

Use the following materials to solve the problems:

8 oz. measuring cup
balance beam scale
1/2 oz. counter weight
flour
water
sugar



Discover the answers to the following questions. Record your work and answers in the space provided.

Challenge #1: How can you find out which of the materials (flour, water or sugar) weighs the most?

Challenge #2: How much does the water in one cup weigh? How much does the flour in one cup weigh? How much does the sugar in one cup weigh?

Challenge #3: Find the cost of a cup of flour. Find the cost of a cup of sugar. (Hint: Study the illustration.)

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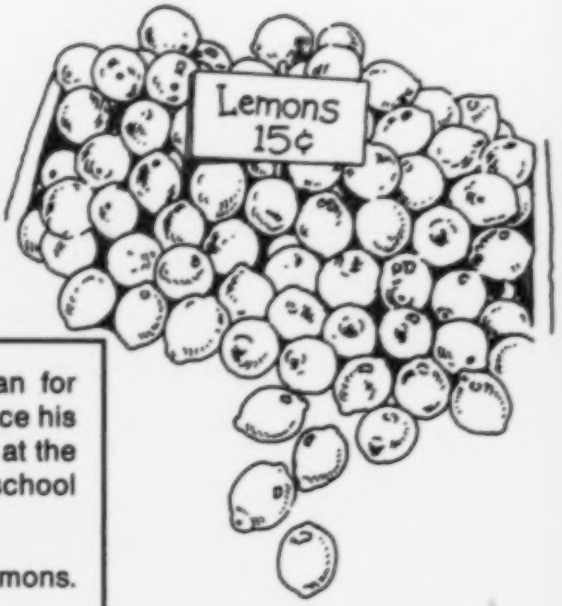
Making a Profit

Profit is the difference between the selling price of an item and the cost of the item.

Read the story and answer the questions.



When Mr. Clark was a boy, he discovered a plan for earning extra spending money. With the 5¢ allowance his mom had given him, young Jimmy bought a lemon at the market. Later, he sold the lemon to a friend at school for 15¢.

The next day, Jimmy took the 15¢ and spent it all on lemons. He again sold the lemons at school for 15¢ each.

Jimmy now had more money in his pocket (45¢) than most boys his age, but he continued spending all of his money buying 5¢ lemons and selling them for 15¢ each.

1. How long did it take Jimmy to earn more than $10.00? _____

2. How many lemons did Jimmy's friends have to eat in 10 days? _____

3. How long would it take Jimmy to make more than $1,000,000?

   _____

4. Why doesn't everybody sell lemons? _____

   _____

   _____

5. What could happen to cause Jimmy to lose money with this plan?

   _____

   _____

   _____

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Making the Best Buy

Mr. Clark reminds us: Sometimes the cheapest price is not the best buy.

1. Decide which purchase in each group below is the best buy. Circle your choice.

a.

24 oz.
$.50

36 oz.
$.75

48 oz.
$.96

b.

1 pound
$.85

2 pounds
$2.25

5 pounds
$4.00

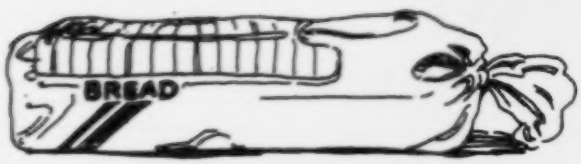
c.

1 cup
$1.50

2 cups
$2.80

5 cups
$6.00

d.



36 slices $1.00

24 slices $.75

2. Explain your reasons for making each choice.

_____

_____

_____

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Researching a Problem

1. The Question: What I Need to Know

   On page 7 you wrote a question about the inventory of a store. Rewrite your questions below.

   _____

   _____

   _____

2. The Procedure: What I Will Do

   Before you can answer your question, you must know the type of numerical data (numbers) you need to collect. You must also know what to do with the data when they are collected. Write these ideas in the spaces below.

   a. Data Collection: What Numbers I Will Collect

   _____

   _____

   b. Data Analysis: How I Will Use These Numbers

   _____

   _____

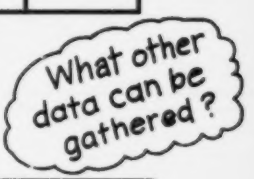
   _____

   c. Use the following chart for your data collection:

Name of Item	Size	Count	Unit Cost to Store	Unit Price to Customer	—	—

3. The Conclusion: What I Have Learned

   Answer your original question in the space below.



   _____

   _____

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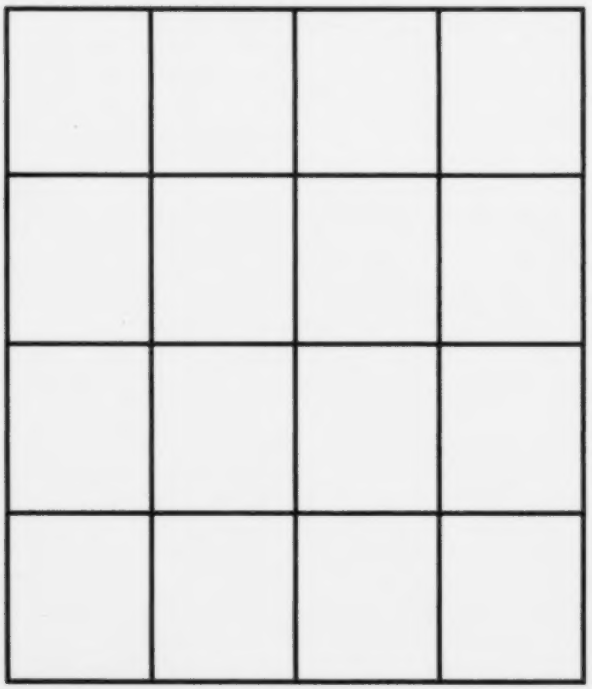
Solving the Puzzle

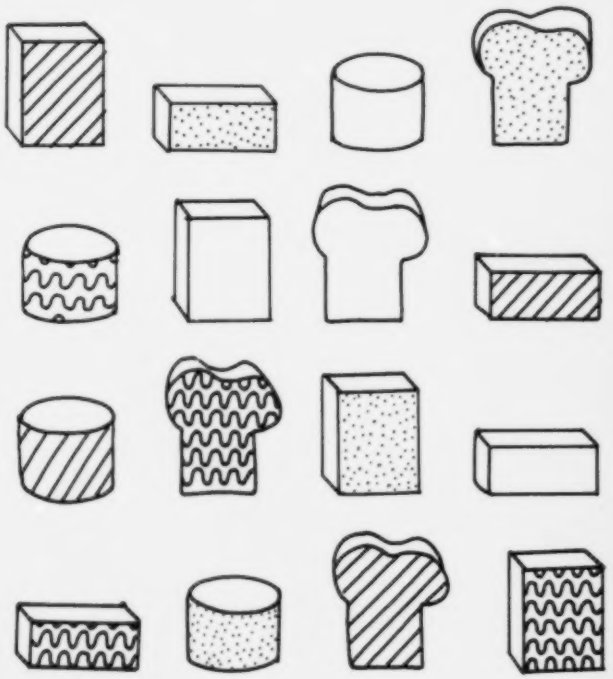
Mr. Clark wants to display his merchandise in unique ways. He has four loaves of bread, four boxes of cereal, four sticks of margarine and four cakes. The packages for one of the loaves, boxes, sticks and cakes have dots. Some packages have zigzags. Others have stripes. Some packages are plain.

Cut out the manipulatives at the bottom of the page. Use these manipulatives to solve the problems.

1. Place the items on the shelves so that no two articles having the same shape or package are in the same row across.
2. Place the items on the shelves so that no two articles having the same shape or package are in the same column down.
3. Place the items so that no two articles having the same shape or package are in a row or column.
4. Place the items so that no two articles having the same shape and package are placed in rows, columns or diagonals.

Help Mr. Clark arrange his merchandise in a unique way. When you have your final arrangement, glue the items in place. Ask your friends to try to guess the pattern you used to display the items.





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Solving Problems at the Corner Store

Read each problem. Solve each problem in the space provided.

1. Mr. Clark makes 36 cents profit on every box of cereal he sells. If he sells 12 boxes of cereal, how much profit will he make? _____
2. Sammy bought a loaf of bread for 85 cents, a melon for 34 cents, and a can of pudding for 25 cents. How much money did he spend? _____
3. Sammy bought a magazine for $1.79. How much change did he receive from $2.00? _____
4. Sammy spent 84 cents on jelly beans. If one ounce of jelly beans cost 7 cents, how many ounces did he buy? _____
5. Sammy wants to buy stickers for 98 cents. In one pocket he has 35 cents and 2 bottle caps. In the other pocket he has 16 cents. How much more money does Sammy need? _____
6. 12 eggs cost $1.92. How much does one egg cost? _____.
7. Sammy received 65 cents in change when he made an 85-cent purchase. How much money did he give to the storekeeper? _____
8. How much profit can Mr. Clark make on 15 loaves of bread? He's able to buy one loaf for 65 cents and sell it for $1.00. _____
9. Final Challenge: Choose one problem above. Use any of the numbers given and your answer to create another problem. Write your problem in the space below. Ask a friend to solve your problem.

_____

_____

_____

_____

_____ 19

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Solving More Problems at the Corner Store

Read each problem. Solve each problem in the space provided.

1. Mr. Clark sold 27 loaves of bread. If the profit on one loaf is 12¢, how much total profit will he make? _____

2. If Sammy can purchase 5 packs of gum for a dollar, how much money does one pack of gum cost? _____

3. Sammy would like to buy a bag of chips for 39¢ and a soda for 55¢. If he has 45¢, how much more money does he need? _____

4. After making an 85¢ purchase, Sammy received 15¢ change. How much money did he give the storekeeper? _____

5. Mr. Clark has 124 cans to place on the shelves. If each shelf will hold 31 cans, how many shelves will be needed? _____

6. Sammy buys a 78¢ sandwich and gives Mr. Clark a one dollar bill. How much change will Sammy receive? _____

7. Mr. Clark can buy a watermelon for $1.25 and sell it for $1.65. How much profit will he make on 18 watermelons? _____

8. Sammy buys 2 packs of gum at 35¢ each and a fizz ball for 19¢. How much money did Sammy spend? _____

9. Final Challenge: Choose one problem above. Use any of the numbers given and your answer to create another problem. Write your problem in the space below. Ask a friend to solve your problem.

_____

_____

_____

_____

_____

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UNIT TWO:
THE TRACK MEET

Before you can see and solve problems about athletic performances, you must understand what athletes do. You must know how to measure their accomplishments. Mathematics allows us to measure athletic performances.

More importantly, math provides us with a way of measuring our own progress and the accomplishments of our favorite athletes.

Look at the picture carefully. José Cruz is measuring how quickly his friend, Maria, can run. Other boys and girls are practicing their jumping and running. All are using mathematics.

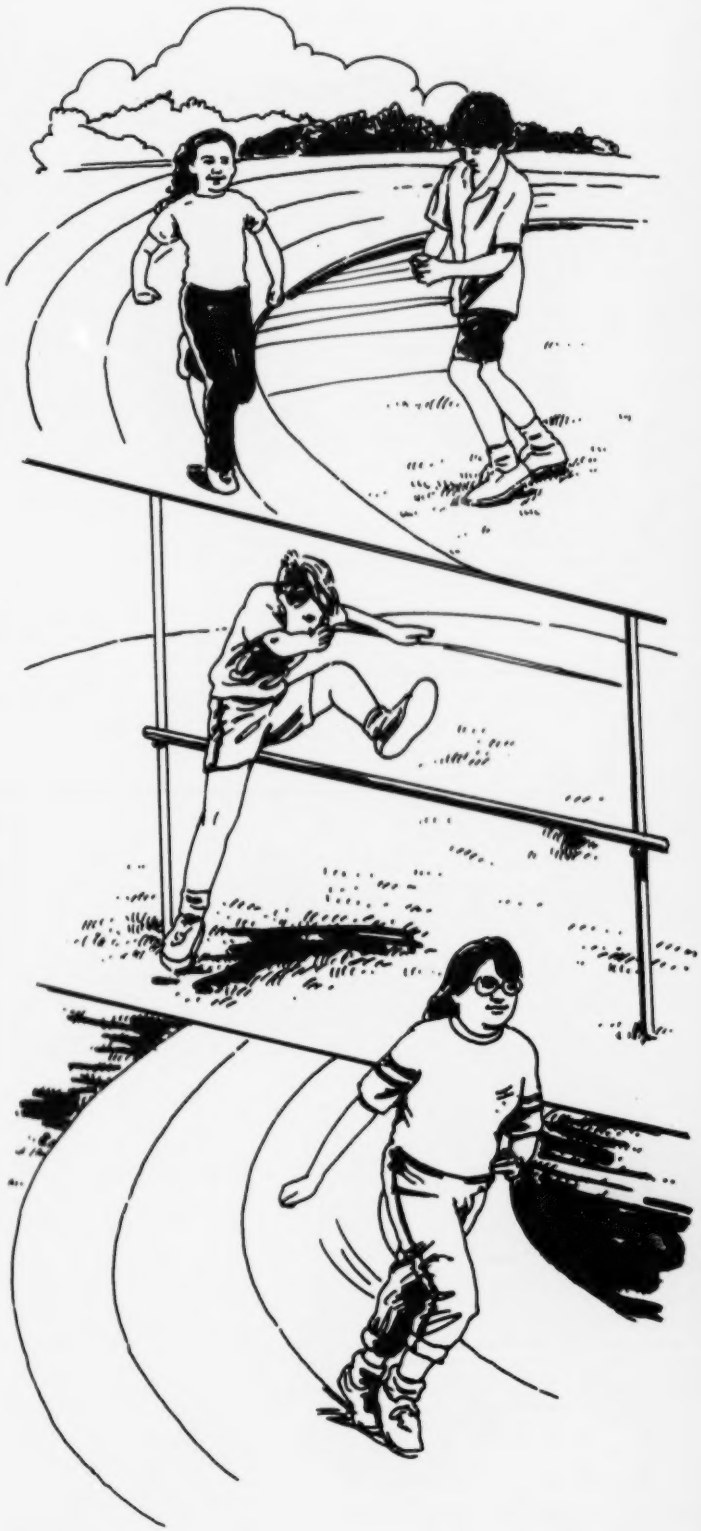
Do you know:

How to measure an athlete's performance?

The differences in track and field events?

How to score a track event?

Tell about the math you see in the picture.



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Watching a Track Meet

Maria has just crossed the finish line. José is watching. He is solving a math problem, too.

Notice the stopwatch and clipboard that José is holding in his hands. Together, the stopwatch and the chart provide clues to the questions José is trying to answer.

1. What information is José obtaining with the stopwatch?

   _____

   _____

   _____

2. What information is José charting on the clipboard?

   _____

   _____

   _____

3. What is a math question that José is asking?

   _____

   _____

4. What is the answer to José's math question?

   _____

   _____

5. What other questions might José be asking about Maria's athletic performance?

   _____

   _____

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Interviewing an Athlete

Athlete _____

Event _____

Team _____

Date _____

Interviewer _____

Interview an athlete at a track and field meet or ask an athlete to visit your classroom. Ask this person the following questions. Write the responses to the questions in the spaces provided.

1. How would you describe your track and field event so a mathematician would understand what you do?

   _____

   _____

   _____

2. How is your performance in the event measured?

   _____

   _____

3. What rules ensure that the performance of every contestant is measured in the same way?

   _____

   _____

4. What mathematical factors affect your performance in this event?

   _____

   _____

5. What performance goals do you have for this track and field season?

   _____

6. How close are you to meeting your goals at this present time?

   _____

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Recognizing Patterns

Many math problems can be solved by recognizing the number patterns in situations. If a number pattern is recognized, this pattern can often be extended.

Solve the following problems by finding the number pattern. Show your work in the space provided.

Use the charts to help discover the pattern.

1. Members of the Striders Track Club were excited. They had done their very best in the championship meet. Club members were congratulating each other with high fives. Thirty-six high fives were exchanged. Each club member high-fived each of the other members. How many members are there on the Striders Track Club?

Number of Members	Number of High Fives	Total High Fives Eliminated
1	0	0
2	1	1
3	3	4
—	—	—
—	—	—
—	—	—

2. After the track meet, a celebration party was held at the coach's house. All club members and their friends were invited. When the coach answered the first doorbell ring, one person entered the house. Each time the doorbell rang, a group entered that had two more persons than the previous group. How many guests had arrived after the ninth ring?

Number of Rings	Number of People Entering	Number of People at Party
1	1	1
2	3	4
3	—	—
—	—	—
—	—	—

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Group Problem Solving

Use the following guidelines to solve the problem:

1. Your group should have 2 to 4 members.
2. Each group member is responsible for his own behavior.
3. Each group member must agree on the solution to the problem.
4. Before asking for help, be sure each group member agrees on the question.
5. Your group may elect to work backwards from a given solution.

The Race

Maria, José and their friend, Martin, practice running laps together every day. The track they run on is 90 meters long. The three athletes, however, do not run at the same speed. Maria is very fast. She runs 9 meters per second. José is almost as fast. He runs 6 meters per second. Martin runs 3 meters per second.

If the three runners continue to run around and around the track without stopping, they will, at some point, be running side by side.

When and where on the track will this happen? Work together as a group to solve this problem. Make a chart to show your work in the space below. A diagram might also be helpful.

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Guessing and Testing

Many math problems can be solved by guessing the answers and then testing your guess to see if it meets the problem conditions. Ideally, each test tells you how to make a guess that is closer and closer to the answer.

Try this strategy on the following problem. The chart at the bottom of the page will help you keep track of your guesses.

Winning Big

The Striders had a successful track meet. They placed (had members who finished either first, second or third) in 8 different events and scored a total of 22 points.

How many first place ribbons (5 points), second place ribbons (3 points), and third place ribbons (1 point) did the Striders win?

TRIAL 1		TRIAL 2		TRIAL 3	
Finish	Points	Finish	Points	Finish	Points
1st	5				
Total___	Total___	Total___	Total___	Total___	Total___
TRIAL 4		**TRIAL 5**		**TRIAL 6**	
Finish	Points	Finish	Points	Finish	Points
Total___	Total___	Total___	Total___	Total___	Total___

25

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Comparing Performance

Differences in athletic performances are often attributed to body strength, speed and flexibility. Each of us performs differently because each of us has different bodily strengths and weaknesses. Record the data in the chart below.

	My Name	Names of My Friends	
Height (in inches)			
Weight (in pounds)			
40-yard dash (in seconds)			
Standing broad jump (in feet)			
Sit-ups (in three minutes)			
Standing vertical leap			
Chin-ups (in one minute)			
100-yard run (in seconds)			

Make conclusions about the degree of each person's athletic ability according to his/her strength, speed and flexibility.

_____

_____

_____

_____

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Pacing Yourself

On the playing field, mark off a start and finish line ten yards apart.

1. Beginning at the starting line, count the number of strides it takes you to run the 10-yard distance. _____

   How could you determine the length of one pace?

   _____

2. Knowing your pace can be helpful. Suppose you wanted to estimate the distance from one place to another. You could run the distance, counting your strides as you go. Try it. Then determine the distance you traveled.

Number of Strides	Length of Pace	Estimated Distance
_____	_____	_____

3. Suppose you wanted to run a half a mile (880 yards). How could you estimate when you were finished?

   _____

   _____

4. Use the "pacing method" to estimate the distance from your house to a place where you walk frequently. Write down the steps you take between your home and this place. Determine the distance between the two places.

   _____

   _____

   _____

   _____

   _____

   _____

   _____

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Group Problem Solving

Use the following guidelines to solve the problems:

1. Your group should have 2 to 4 members.
2. Each group member is responsible for his own behavior.
3. Each group member must agree on the solution to the problem.
4. Before asking for help, be sure each group member agrees on the question.
5. Your group may elect to work backwards from a given solution.

Sports Camp

The counselor at a track and field sports camp has obtained results from preliminary events held on the first day of camp. The results are as follows:

Name	50-Yard Run in Seconds	100-Yard Run in Seconds	High Jump	Long Jump	Swim
Andy	7.9	14.6	4'2"	10'9"	3
Brian	9.4	16.5	3'4"	10'0"	1
Charlie	7.0	13.5	4'4"	11'6"	4
Doug	7.8	14.4	4'7"	12'0"	3
Eric	6.8	12.6	4'8"	12'2"	4
Fred	8.0	14.5	4'1"	10'9"	2
Greg	8.1	15.0	4'3"	10'6"	2
Herb	7.2	13.8	4'3"	9'6"	4
Jon	7.7	14.0	4'4"	10'11"	2
Kevin	7.4	14.0	3'8"	11'2"	3
Larry	7.7	14.2	4'6"	11'0"	3
Mike	8.0	15.0	4'0"	10'2"	2

Note: Swim levels: 1 = lowest level; 4 = highest level.

The comments of school coaches on the camp entrance form are as follows:

Andy: Tremendous effort has helped Andy make some real gains, but his performance is not consistent.

Brian: Poor attendance at practice, an unwillingness to follow team rules and not

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taking practice seriously has contributed to Brian's poor performance.

Charlie: Charlie has consistently worked hard.

Doug: Doug has good endurance in most running events but lacks motivation in some throwing events.

Eric: Eric is a dedicated and motivated team leader.

Fred: Fred has fair ability in most events but has a poor attitude toward practice.

Greg: Greg's immature behavior has interfered with his progress and has occasionally disrupted the whole group. He seems to do the least work required to remain on the track team.

Herb: Herb has shown tremendous improvement, but his previous training had been rather weak so he still has a lot to learn.

Jon: Jon has a lot of natural athletic ability but hasn't worked up to his potential because of missed practices and failure to implement suggestions.

Kevin: Kevin needs more challenge and greater competition to make him work harder.

Larry: Larry is a shy boy who doesn't care to be in the spotlight. He just doesn't seem comfortable with heavy competition.

Mike: Although Mike's ability in jumping events is not outstanding, he has made good progress in sprinting.

Based on the above facts and comments, make decisions and assign each camper to a training group.

Group A	Group B	Group C
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Give reasons for decisions in the space provided.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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Recording Personal Performance

Regular exercise can improve your physical ability. Here is a simple exercise that many athletes use to improve grip strength.

Exercise: Tennis Ball Squeeze

Grip a tennis ball firmly in your right or left hand. Squeeze and release your grip on the ball as rapidly as you can for 30 seconds. Count the number of squeezes in 30 seconds. Record this number and any related observations in the space provided.

Record this information every morning and afternoon for a five-day period.

Day	Time of Day	Number of Squeezes/30 Sec.	Comments
1	a.m. p.m.	____ ____	
2	a.m. p.m.	____ ____	
3	a.m. p.m.	____ ____	
4	a.m. p.m.	____ ____	
5	a.m. p.m.	____ ____	

From the data collected, record your own conclusions about the relationship between practice and performance.

_____

_____

_____

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Planning Classroom Olympics

With your classmates and teacher, organize your own classroom Olympics. Make up events that can be held indoors. Determine ways to accurately measure individual performance for each event. Below are examples of two events.

The Two-Handed Paper Toss

Each contestant is given a standard 8½" x 11" sheet of paper. Each person is allowed 30 seconds to prepare the paper for throwing. Contestants may fold, crumple, mash or tear the paper, but they may not add any material to the paper. Each contestant then hurls the paper, but at the moment of release, both hands must be in contact with the paper. Student judges then measure each throw, using a standard unsharpened pencil. The winner is the contestant whose paper travels the greatest number of pencil lengths.

The Standing Run

The contestant stands in front of a sturdy wooden platform or stair (approximately 6 inches high). At the sound of two erasers thudding together, the contestant steps up on the stair and then steps down and repeats this procedure as fast as possible. Judges count the number of step-ups each contestant completes in a 20-second time period. The winner is the contestant with the greatest number of step-ups in the 20-second time period.

Brainstorm with your friends and create additional events. Remember, all events must be held in the classroom, so safety aspects must be considered for each event. Describe an Olympic event in the space provided.

_____

_____

_____

_____

_____

Conduct your classroom Olympics once all the events have been properly planned and evaluated.

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Thinking Logically

Read the story and solve the problem.

The Championships

Teams from four clubs participated in the city track and field championships. The teams were the Striders, Drifters, Speed Demons and Lightning Express. The captains of the four teams were Johnny, Maria, Wendy and Jarvis. The following statements were made about the teams and their captains regarding how they finished in the championships:

1. The parents of the team captained by Wendy were proud of their team for defeating the team captained by Johnny.
2. Captain Maria thought that her team would have finished better than third if they had been more relaxed.
3. The Striders finished below the team captained by Johnny and above the team captained by Jarvis.
4. The Speed Demons did not finish first.
5. The Lightning Express finished higher than the team captained by Jarvis and lower than the Drifters.

Clue #1

Captain Wendy Johnny

Clue #2

Captain Wendy Johnny

Clue #3

Captain Wendy Johnny

Clue #4

Captain Wendy Johnny

Rank the teams from first through fourth and name the captain of each team. Use the line diagrams to help you make these decisions.

Team	Captain
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____

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Solving Problems at the Track Meet

Read each problem. Solve each problem in the space provided.

1. Maria ran the first 400 meters of a 2000-meter race in 65 seconds. At that pace, how long did it take her to run the entire race?

2. Carlos threw the javalin 3 times. His first throw was 120 feet. His next throw was 135 feet. His last throw was 97 feet. How much better was his best throw than his worst throw?

3. Before the last track and field event, the Striders had 104 points and the Flashers had 113 points. If the Flashers earn 2 points in the last event, how many points must the Striders earn in order to win the meet?

4. Bill jumped 14.3 feet in the long jump. Gary jumped 12.5 feet. How much further did Bill jump than Gary?

5. The 4 members of the Strider relay team ran the 400-meter relay race in 64 seconds. What was the average time it took each runner to run his/her leg (100 meters) of the race?

6. 874 spectators watched the track meet. This was twice as many spectators as there were at last week's meet. How many people watched last week's meet?

7. The Striders have 3 different color shirts and 2 different color shorts they wear as uniforms. How many different color combinations do they have?

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Solving More Problems at the Track Meet

Read each problem. Solve each problem in the space provided.

1. Maria ran the 200-meter dash in 31.5 seconds. Bill ran the 200 meters in 32.0 seconds. How much faster was Maria than Bill?

2. Maria ran 100 meters in 11.0 seconds. If she could keep up this same pace, how long would it take her to run 400 meters?

3. A total of 248 athletes competed in the track meet. The buses that brought them to the track hold 45 athletes. How many buses were needed to bring the athletes to the meet?

4. José has 1 pair of red socks, blue socks and white socks. He also has 3 T-shirts: a red one, a blue one and a green one. He wears almost any combination of colors, but he never matches his T-shirt with his socks. How many different clothes combinations can José make?

5. The Striders scored 48 points in the championship meet. This is 3 times as many points as they scored the previous year. How many points did they score last year?

6. In the high jump, Maria cleared 49.8 inches. Carlos jumped 54.4 inches. How much higher did Carlos jump than Maria?

7. There were 45 bottles of thirst quencher left after the meet. The officials decided to distribute the remaining bottles to the 3 participating teams. How many bottles did each team receive?

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UNIT THREE:
THE CONSTRUCTION SITE

Before you can see and solve problems about constructing buildings, you must understand the mathematics that carpenters, plumbers and other contractors use in their work. The best place to observe this mathematics is at a site where a building is being constructed.

Look at the picture carefully. John is visiting his father at work. Mr. Faber is the contractor for constructing new buildings. His job is to make sure that everyone follows the building plans. To do this, Mr. Faber uses a great deal of mathematics.

Do you know:

What mathematic skills are needed to build a house?

Why building plans are necessary?

Why geometry is important at the building site?

Tell about the math you see in the picture.

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Working Together

Many people with different skills work together at a construction site. John's dad is a contractor. He supervises all the different jobs that must be done at the site. What kinds of jobs are there at a construction site? Name as many jobs as you can in the space provided.

_____

_____

_____

Regardless of the different jobs at the construction site, everyone works together to solve problems of mathematics. A question often asked is, "How can we build a quality house for the least amount of money?"

Workers with different skills might suggest different answers to this question. Below are construction workers. Tell how each worker might build a quality house for the least amount of money.

_____

_____

_____

_____

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Interviewing a Contractor

Name _____

Trade _____

Company _____

Date _____

Interviewer _____

Ask a contractor to visit your classroom. Write the responses to the questions in the spaces below.

1. What types of work do you do at the construction site? _____

2. How do you use mathematics in your work? _____

3. What is the hardest math problem you've solved recently? _____

4. What is an example of a math problem that you solve frequently? _____

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Drawing Pictures and Diagrams

The contractor refers to floor plans whenever he/she needs to answer a question about a house under construction. A floor plan is a picture or diagram that shows how house-building problems may be solved.

Draw a picture or diagram to help solve these problems.

1. Houses may be painted one of 5 overall colors: yellow, blue, white, brown or red. The trim on each house may be orange, black, or white. How many different ways may the houses be painted?

2. How many 2′ x 2′ squares (two feet on each side) may be cut from a sheet of 4′ x 8′ plywood?

3. Concrete workers built a patio using three square slabs of concrete. They poured the square slabs side by side to form a large rectangle. Then they placed 120 feet of wood trim around the edge of the rectangle. How big are each of the three slabs?

4. A carpenter had one more board to cut, but he could not find his tape measure. Should he just guess at the measurement? Luckily he had an 8½″ x 11″ paper. It was just the size of the paper you are holding. How can the carpenter use this paper to measure and cut 6 inches off the board?

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Group Problem Solving

Use the following guidelines to solve the problems:

1. Your group should have 2 to 4 members.
2. Each group member is responsible for his own behavior.
3. Each group member must agree on the solution to the problem.
4. Before asking for help, be sure each group member agrees on the question.
5. Your group may elect to work backwards from a given solution.

The Sign Painter

Mike Angelo is a sign painter. He painted the house numbers on each mailbox in a new housing development. Mike was paid $1.00 for each digit he painted. When Mike finished his job at the housing development, he was paid $297.00. How many houses are in the development? Make a chart showing easier painting jobs and the amount Mike is paid for each. (Hint: There are more than 100 houses and less than 200 houses.)

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Isolating "Wants" and "Givens"

The first step in solving story problems is to isolate the "wants" and "givens" of a problem. You must understand what question the problem wants you to answer and what information the problem gives you in order to answer it.

Read the story. Match the problem "wants" with the "givens" that make the solution possible.

Carl and Javier are bricklayers. They are building the walls for 125 new homes in a subdivision. Each house the two men build will have 6200 bricks in it. Carl is 28 years old. He can lay 45 bricks in one hour. Javier has been laying bricks for 4 years. He began laying bricks when he was 18 years old. Javier can lay an average of 300 bricks every day. Both bricklayers work 6 hours each working day.

1. Wants: How many bricks are needed to build all the homes in the subdivision?

   Givens: _____

   _____

   _____

   Solution: _____

   _____

   _____

2. Wants: Which bricklayer is older?

   Givens: _____

   _____

   _____

   Solution: _____

   _____

   _____

3. Wants: How long will it take Carl and Javier to build one home?

   Givens: _____

   _____

   _____

   _____

   Solution: _____

   _____

   _____

4. Wants: How long will it take the two men to build all the homes in the subdivision?

   Givens: _____

   _____

   _____

   _____

   Solution: _____

   _____

   _____

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Tessellating Tiles

The kitchen tile floors laid in the new homes of the subdivisions are an example of tessellation. Notice how the hexagonal shape repeats itself over and over to make a pattern. Figures which form such patterns without gaps or overlaps are said to tessellate.

Here are six regular polygons. Trace several copies of each shape. Try to tessellate each figure.

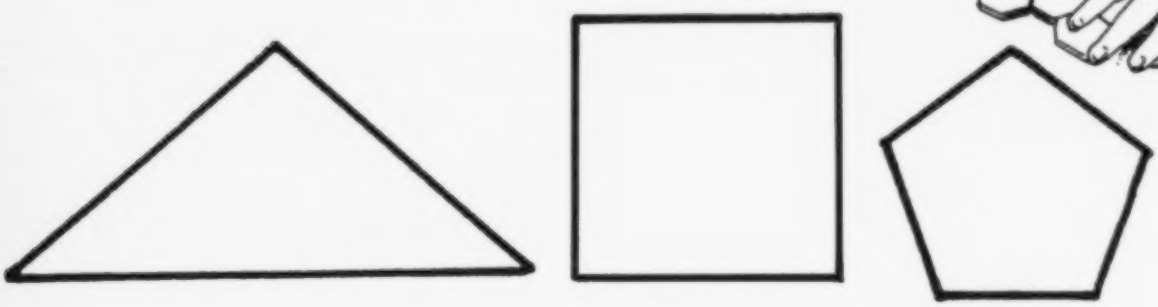
Which figures tessellate? _____

_____

_____

_____

_____



triangle square pentagon

heptagon hexagon octagon

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Constructing Domes

Dome houses are an alternative to common rectangular houses. Some contractors believe domes will be popular in the future because they are strong, easy to construct and less expensive than traditional houses.

You can learn many of the principles of building dome structures by making miniature models. Toothpicks and small balls of Play-Doh (gumdrops work, too) are the only materials needed.

Starting with a regular polygon as a base (triangle, square, pentagon, hexagon, etc.), construct several domes. Note construction problems as they arise and record your solutions to these problems.

Construction Problems

_____

_____

_____

Solutions to Problems

_____

_____

_____

_____

_____

_____

_____

_____

_____

Check the polygons below that make workable dome bases.

triangles_____ squares_____ pentagons_____

hexagons_____ heptagons_____ octagons_____

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Framing a House

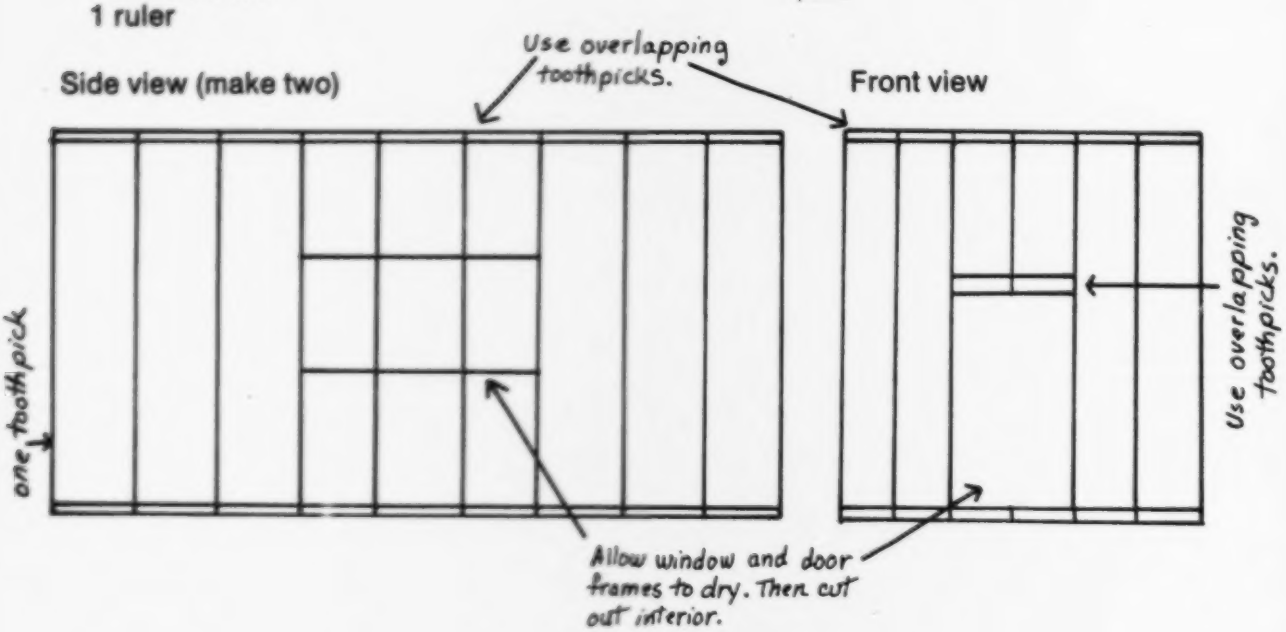
The framing acts as the skeleton for the house. All sheathing material (wallboard, paneling, etc.) is attached to the frame. The frame of a house is usually made with 2" x 4" boards that are 8' long.

Use the following materials to build a frame house, using toothpicks instead of 2" x 4" boards. Follow the pattern below.

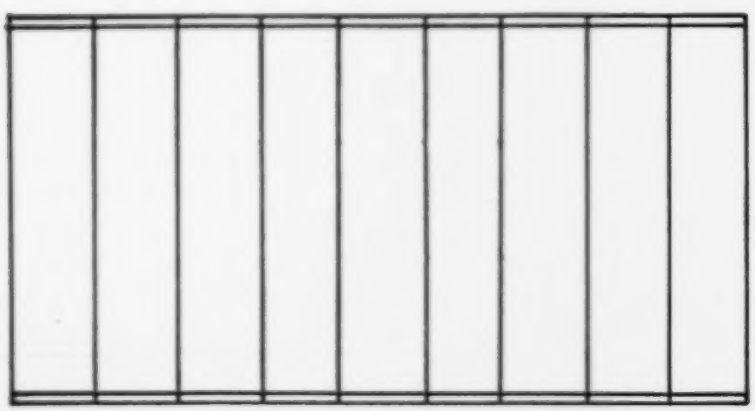
Materials:

- 1 box toothpicks
- 1 tube white glue
- 1 X-acto knife
- 1 ruler

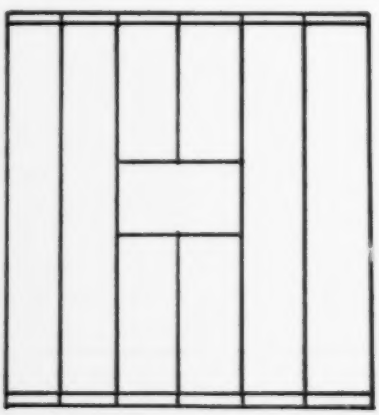
Side view (make two)


Use overlapping toothpicks.
Front view
one toothpick
Use overlapping toothpicks.
Allow window and door frames to dry. Then cut out interior.

Roof (make 2)



Back view



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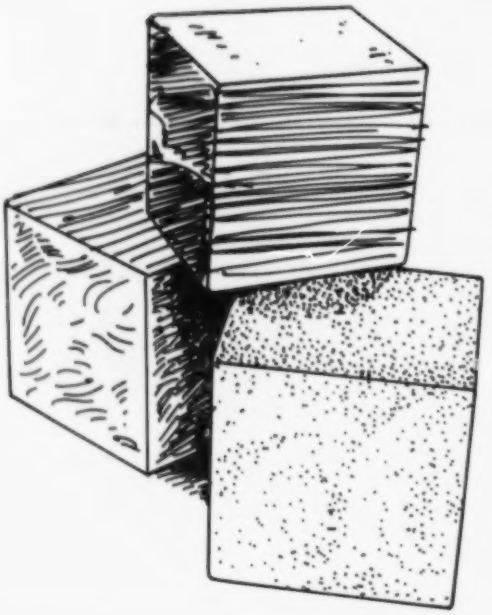
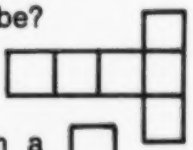
Constructing Cubes

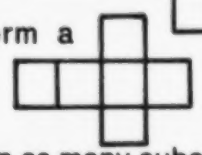


A cube is constructed of six identical square sides. Many designs are possible when constructing a cube.

1. If you cut out and folded this design, would it form a cube? _____



2. Would this design form a cube? _____



3. On the grid below, design as many cubes as possible. Cut out and fold each design to test your construction of a cube.

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Drawing to Scale

An architect draws plans that show how to construct a building. The drawings are a smaller scale of proportion than the actual size of the building.

Use the graph paper below to make a scale drawing of your bedroom and its furniture arrangement. Then rearrange the furniture in your bedroom.

Let ¼ inch on the graph paper equal 1 foot in actual size. You may find it easier to cut out pieces of paper to represent your furniture. This will allow you to move the furniture and see if it will fit in different areas of the room.

My Bedroom Arrangement

My Bedroom Rearrangement

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The Clean-Up Game

At the end of a long day, the final job for all workers is to clean up the construction site.

Today the workers are having a friendly contest of wits as they pick up all the extra boards on the ground. Each worker tries to leave the last board for someone else to pick up. Each worker may pick up one, two or three boards at a time.

Play The Clean-Up Game. Use toothpicks to represent boards. Study the game by playing it several times with a friend. Try to discover how to have your partner pick up the last "board." Try several different strategies. Record the results of each strategy in the space provided.

Strategy 1	Strategy 2	Strategy 3
Results	Results	Results

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GA1070

Solving Problems at the Construction Site

Read each problem. Solve each problem in the space provided.

1. Gary had some nails in his nail bag. He used 45 nails on the wood panels. He had 38 nails left in his bag. How many nails did Gary have when he began his work?

2. A gallon of paint will cover 250 square feet of surface. The room to be painted contains 2000 square feet. How many gallons of paint will be needed?

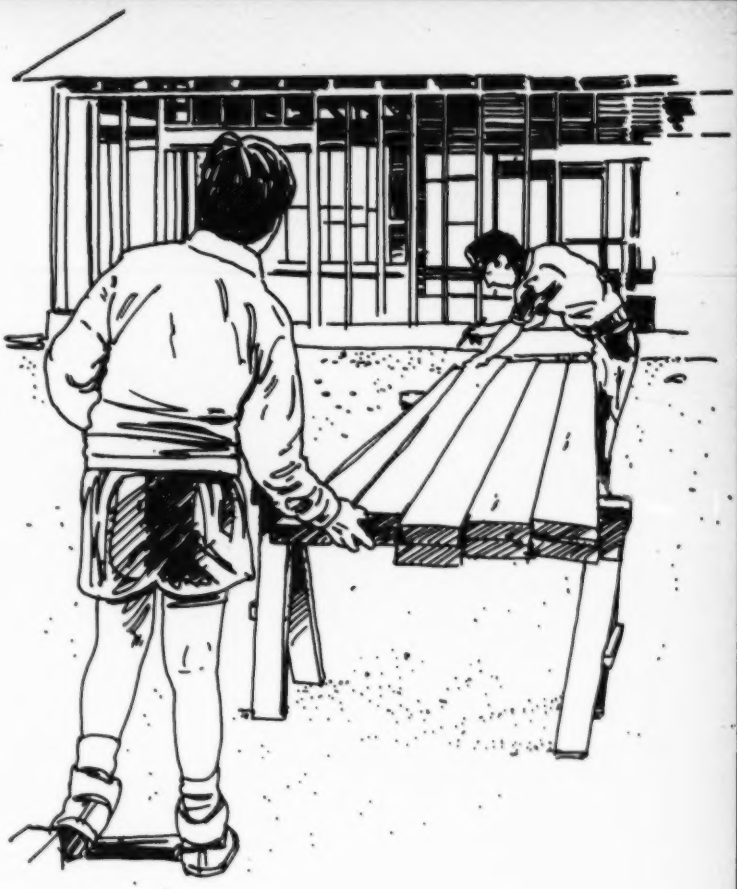
3. If a 24-foot board is cut into three equal pieces, what is the length of each piece?

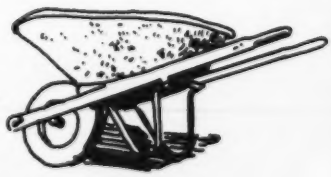
4. A house in the new development costs $55,000. The buyer has $27,000. How much more money does this person need in order to buy the house?

5. It takes about 115 hours to build the frame of a house. How long will it take to frame 9 houses?

6. The contractor worked 65 hours the first week, 68 hours the second week, 64 hours the third week and 53 hours the fourth week. How many hours did the contractor work in the four weeks?

7. If it takes 10 people 2 weeks to build a house, how long will it take 5 people to build the same house?





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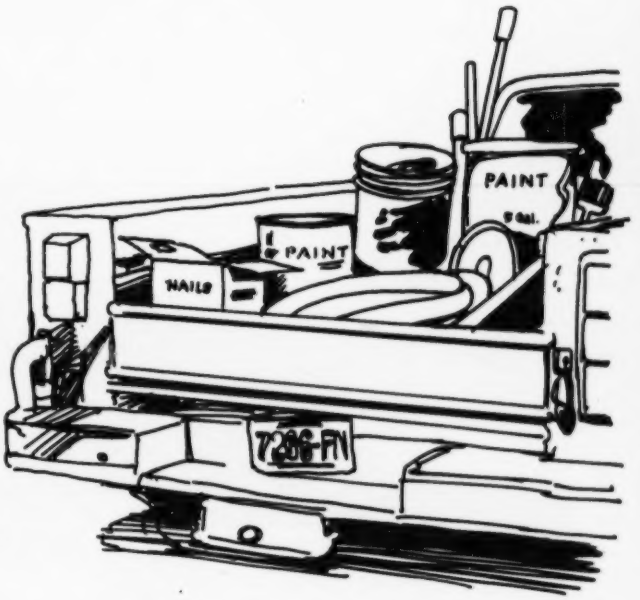
Solving More Problems at the Construction Site

Read each problem. Solve each problem in the space provided.



1. There are 235 houses in the new development. 87 of the houses are painted white, 54 are yellow and the rest are tan. How many houses are painted tan?

2. There are three sections in the new development. The first area has 43 houses. The second area has 54 houses. The third area has 57 houses. How many houses are in the new development?

3. 56 people work for the general contractor at the construction site. This is 4 times more than the number of people who worked for the contractor on the last project. How many people worked on the last project?

4. All 345 new houses in a development will have four exterior doors to the outside. How many exterior doors must be installed?

5. 8 workers can paint a new house in 4 days. How long will it take 16 workers to paint the same house?

6. A sheet of plywood covers 32 square feet. How many sheets will it take to cover 192 square feet?

7. If a family buys the new house before it is built, it will cost $48,750. If they wait until after it is built, the price will increase to $54,635. How much will the family save by buying an unbuilt home?

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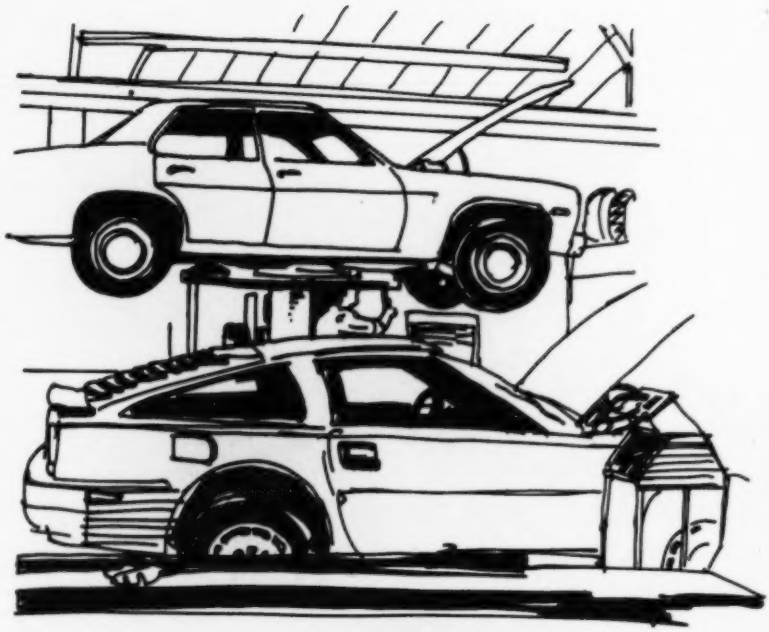
UNIT FOUR: THE SERVICE STATION

Do you know:

How mathematics helps to keep your family car running smoothly?

How mathematics is used to identify a problem when your family car isn't running properly?



Before you can see and solve problems about the family automobile, you must understand the mathematics related to your car's performance and maintenance. A service station attendant is a good person to teach you about the mathematics of your family automobile.

Look at the picture carefully. Jill and her mother are self-servicing their car. In the garage, Mr. Tomey, the mechanic, is completing repair work on another vehicle. Everyone is using the mathematics of cars.

Tell about the mathematics of interest to each person in the picture.

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Servicing Cars

The men and women who work at service stations provide assistance to drivers and their cars. These services involve asking and answering many questions about mathematics.

Below are people who work in a service station. Write a math question that these people might be asking.

Service station attendants also answer the mathematical questions of drivers. In the picture below, what math question might Jill's mom be asking? What answer might Mr. Tomey be giving? Write her question and his answer in the space provided.

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Interviewing a Service Station Owner

Mechanic _____

Workplace _____

Date _____

Interviewer _____

Invite a service station owner to visit your class. Ask this person the following questions. Write the responses to the questions in the spaces provided.

1. What kinds of work do you do at the service station?

_____

_____

2. How do you use mathematics in your work?

_____

_____

3. What is an example of a math problem that you solve frequently?

_____

_____

4. What different measuring tools do you use in your work?

_____

_____

5. How do your measuring tools help you decide what is wrong with a car?

_____

_____

6. Since the time you've worked at the service station, what new ways have you learned to use mathematics?

_____

_____

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Working Backwards

We sometimes work backwards in solving a problem when the outcome is known and we are able to study the steps leading to this outcome. Try working backwards to solve the following problems.

1. TIRE SALE

   Jill's mom drove into the service station with a pocket full of money. She spent half of her money plus four dollars on gas and oil. Then she saw that the service station was having a great sale on new tires. She bought two. The tires took half of her remaining money plus two more dollars. Jill's mom now has six dollars left. How much money did Jill's mom have when she drove into the service station?

2. GAS SALE

   One morning, when Jill's mom was driving her to school, they noticed a small sign at the service station that read: GAS 50¢ A GALLON. SALE BEGINS AT 5:00 P.M. TODAY.

   "Wow," exclaimed Jill's mom, "that's half price! We'll have to stop on the way home and fill up the car. I hope there will be enough gas left for us." "Maybe no one will find out about the sale," remarked Jill. "Just don't tell too many of your friends at school so they won't tell their parents."

   When Jill got to school, she told her best friends about the half-price gas sale. She cautioned them against telling too many others.

   Later, at morning recess, Jill's best friends each told one other person. At lunch break, everyone who knew at that time told one more person. Finally, at afternoon recess, everyone who knew at that time told one more person.

   At five o'clock, Jill's mom pulled into the service station. There were 48 cars in front of her! "Gee," said Jill's mom. "How many kids did you tell about the gas sale?" "Nowhere near this number," said Jill.

   How many people did Jill personally tell about the gas sale?

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Group Problem Solving

Use the following guidelines to solve the problem:

1. Your group should have 2 to 4 members.
2. Each group member is responsible for his own behavior.
3. Each group member must agree on the solution to the problem.
4. Before asking for help, be sure each group member agrees on the question.
5. Your group may elect to work backwards from a given solution.

Rate: The Car Pool Problem

There are many advantages in car pooling besides saving money. Passengers serve as navigators, solving problems when they arise. For example, one morning Mr. Tomey's car pool picked him up at the usual time, 7:00 a.m. That gave him an hour and a half to drive the 70 miles to work.

An hour and a half is usually plenty of time to get to work. One day, however, traffic was very heavy. The group managed an average speed of only 30 miles per hour for the first 40 minutes. The driver got nervous, fearing everyone would be late for work. When the freeway traffic finally cleared, the driver went very fast. As the needle on the speedometer passed 75, Mr. Tomey said, "Slow down. We don't have to go this fast."

1. How did Mr. Tomey know this fact?

2. How fast would Mr. Tomey have to drive to get to work on time?

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Finding Patterns

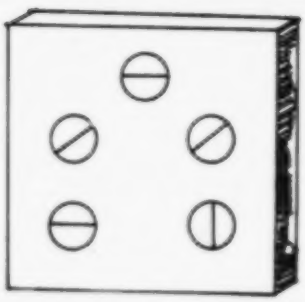
Recognizing patterns is an important strategy in solving many mathematical problems.

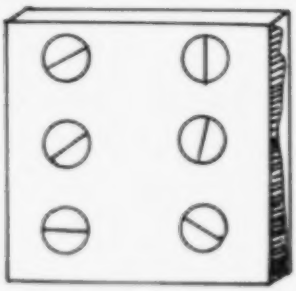
Read the story. Discover the pattern between the wires and the terminals. Let the pattern offer the solution to the problem.

Jill's mom was waiting for her car to be serviced, but Mr. Tomey had his own problems. "All these wires have come loose from those two circuit boards." Mr. Tomey pointed to two circuit boards—one with 5 terminals and one with 6 terminals. "Well, just stick them back on," replied Jill's mom. Mr. Tomey said, "Do you know how many different ways the wires can be attached to the terminals?" "No," said Jill's mom, "I was hoping you knew!"

1. Help Mr. Tomey connect the wires to the terminals. Use the diagrams below to help discover a pattern. Complete the chart showing the number of ways the wires can be attached to the terminals.

Number of Terminals	2	3	4	5	6
Number of Ways to Wire Terminals	1	3	6		





2. Extend the pattern to answer the following questions: How many different ways could a circuit board with 10 terminals be connected? _____

30? _____

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Reading Large Numbers

A person who repairs cars must be able to work with large numbers. For example, many luxury cars cost over $57,500.

If you had trouble reading the price of the luxury car, try using the place value chart below.

Billions Period			Millions Period			Thousands Period			Units Period		
hundreds	tens	ones	hundreds	tens	ones	hundreds	tens	ones	hundreds	tens	ones
							5	7	5	0	0

Using the place value chart, you can see that $57,500 is read: fifty-seven thousand, five hundred dollars.

Below are number problems about cars. Write the numerals in the place value chart above. Then write the numerals as words below.

1. A spark plug fires 2,855,263 times a second. _____

   _____

2. There have been over 45,866,500 cars sold in the world. _____

   _____

3. Every year the combined total of miles driven in the United States is over 345,800,005.

   _____

4. The average car will travel 124,640 miles in its lifetime. _____

Write the following number words as standard numerals:

5. Last year a salesperson drove eighteen thousand, four hundred thirty-two miles.

   _____

6. There are six hundred twenty-five million, seven hundred five thousand, eight hundred twenty-six miles of highway in the United States. _____

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Determining Miles Per Gallon

One morning as Mr. Tomey pumped air into Jill's bike tires, a brand-new car drove up to the gasoline pumps. It was big, bright and shiny. The young man behind the wheel looked proud. There was another way to tell that the car was new. A piece of paper was taped to the side window. On the paper was listed the car's equipment and what each item cost. At the bottom of the paper in big letters was printed 14 mpg.

"That sure is a nice new car, isn't it?" Jill said to Mr. Tomey. "It's fancy enough," replied Mr. Tomey, "but I don't think he's going to like his new car that much. It's going to cost him a fortune to run."

1. How does Mr. Tomey know the car is going to cost a lot of money to operate?

_____

_____

Three cars with different mileage rates are listed on the chart below. Study the number patterns. Then complete the chart.

		Miles traveled per gallons of gas used									
Car	Miles per gallon	2	4	6	8	10	12	14	16	18	20
A	4 mpg	8	16	24	32	40					
B	16 mpg	32	64			160			256	288	
C	32 mpg	64		192		320		448		576	

Use the completed chart to answer the following question:

2. If gas costs $1.00 a gallon, how much would it cost each car to travel 320 miles? Use the space below to work the problem.

   a. Car A _____

   b. Car B _____

   c. Car C _____

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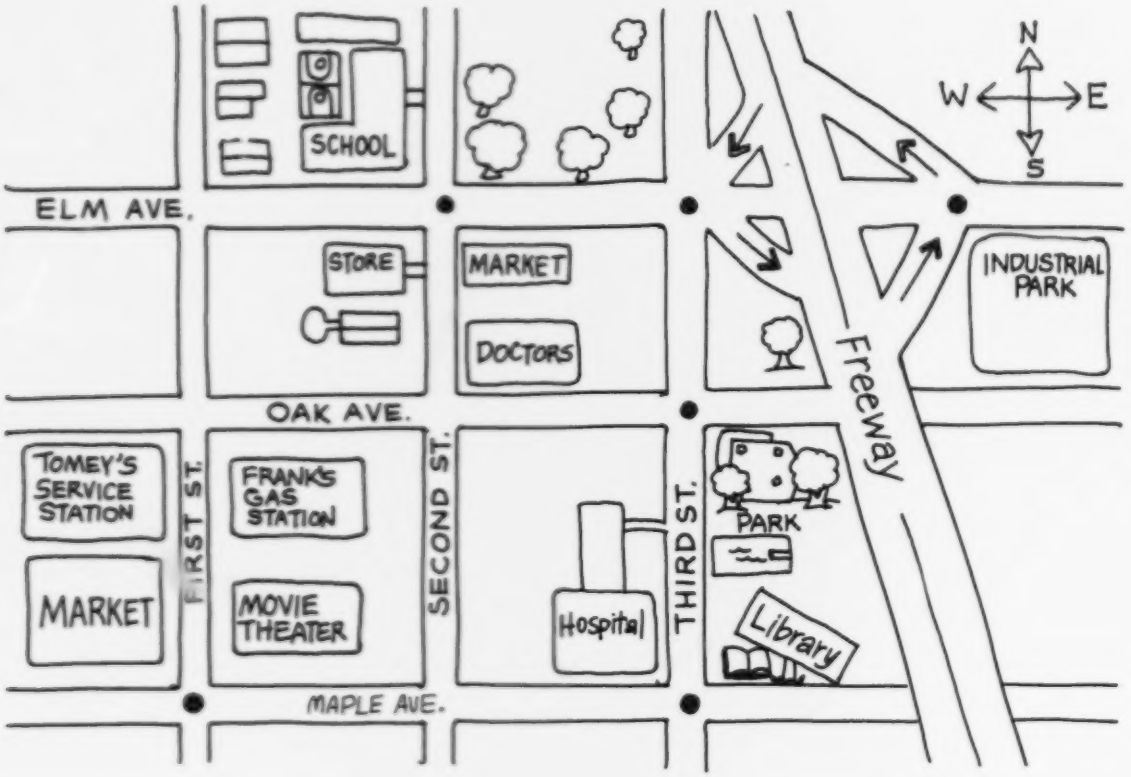
Reading a Map

Mr. Tomey often gives street directions to motorists who are unfamiliar with the area. There are two necessary skills involved: the ability to read road maps and the ability to use mathematics in giving directions.

Study the map below. Note the location of Tomey's Service Station. Put an X on the station.



Use mathematics to give the following directions:

1. Describe how to get from Tomey's Service Station to the library with the least possibility of stopping at a stoplight.

   _____

   _____

2. Describe the easiest way to get from Tomey's Service Station to the freeway going north. First decide what you mean by "easiest."

   _____

   _____

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Servicing the Family Car

Many people use the self-service area at the station. Here they can pump their own gas and clean their own windshields. But there are other checks to the car that should be made frequently.

Below is information to complete the next four times you and your parents stop at the service station. Ask your mom or dad or the service station attendant to show you how to make these checks and measurements.

Date _____
Mileage _____
Gas level _____
Oil level _____
Tire pressure:
right front _____
right rear _____
left front _____
left rear _____
Fluid levels: _____
battery _____
wipers _____

Date _____
Mileage _____
Gas level _____
Oil level _____
Tire pressure:
right front _____
right rear _____
left front _____
left rear _____
Fluid levels: _____
battery _____
wipers _____

Date _____
Mileage _____
Gas level _____
Oil level _____
Tire pressure: _____
right front _____
right rear _____
left front _____
left rear _____
Fluid levels:
battery _____
wipers _____

Date _____
Mileage _____
Gas level _____
Oil level _____
Tire pressure:
right front _____
right rear _____
left front _____
left rear _____
Fluid levels: _____
battery _____
wipers _____

Tell how these measurements change over a period of time.

_____

_____

_____

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Measuring Tools

Measuring tools, gauges and meters are very important devices for the service station mechanic. Not only do these tools provide the means by which the mechanic diagnoses car problems, but these tools also allow the mechanic to fine-tune all systems of the car so that problems are not likely to occur.

Invite a service station mechanic to visit your classroom. Ask this person to bring and explain some of the many measuring tools he/she uses at work. Ask this person to explain how some of these tools are used.

Measuring Tool	Description of Use
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____

Ask the mechanic to teach you how to use one of the measuring tools. Draw a picture of this tool in the space below.

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Thinking Logically

Solve these problems. Show your work in the space provided.

1. A man comes into the service station to get a mixture of gasoline and oil for his outboard motor. He has two tanks of equal size. The man takes a pint of gasoline from the first tank and mixes it thoroughly with the oil in the second tank. Then he takes a pint of this mixture from the second tank and mixes it with the gasoline in the first tank. After this mixing is completed, is there more or less oil in the first tank than there is gasoline in the second tank? Prove it!

2. Mr. Tomey's main competitor for selling gas and oil is Frank's Gas Station located just across the street. To attract customers, both owners posted these prices for their products.

Tomey's Service Station	
Gas	$1.50/gal.
Oil	$ .50/qt.
Total	$2.00

Frank's Gas Station	
Gas	$1.00/gal.
Oil	$1.00/qt.
Total	$2.00

If you were to buy gas at Frank's, you would save 50 cents per gallon. If you were to buy oil at Mr. Tomey's, you would save another 50 cents per quart. This would give you a total savings of $1.00.

However, $1.00 per gallon for gas at Frank's and 50 cents for oil at Mr. Tomey's totals $1.50. This is a savings of only 50 cents from the total price of $2.00.

How could this be? Explain the mistake in logic.

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Solving Problems at the Service Station

Read each problem. Solve each problem in the space provided.

1. José can drive 87 miles on each gallon of gas he puts into his A.T.C. How far can he drive on 4 gallons of gas? _____

2. The minibike John would like to buy costs $470. John has $65. How much more money does he need? _____

3. If John can earn $5 each afternoon at the service station washing cars, how long will it take him to earn the $415 dollars he needs for a new minibike? _____

4. A part for Mr. Faber's car costs $52. This is four times more than the same part cost 2 years ago. How much did it cost then? _____

5. Getting his car tuned up should allow Mr. Clark to drive another 7800 miles before another checkup. His mileage gauge shows 38,476 miles. How many total miles will he have driven when he gets his next car tune-up? _____

6. Mr. Faber bought 7 gallons of gas at 98 cents a gallon and 2 quarts of oil at 85 cents a quart. How much did he spend? _____

7. The storage tank at Mr. Tomey's gas station holds 4500 gallons of gas. Using his measuring stick, Mr. Tomey can tell that there are still 1850 gallons in the tank. How much gas does he need to fill the tank? _____

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Solving More Problems at the Service Station

Read each problem. Solve each problem in the space provided.

1. Jill's mother has 9 gallons of gas in her car. How far can she drive if the car can go 29 miles on each gallon of gas? _____

2. Today gas costs 98 cents a gallon. That's three times as much as it cost 10 years ago. How much did it cost then? _____

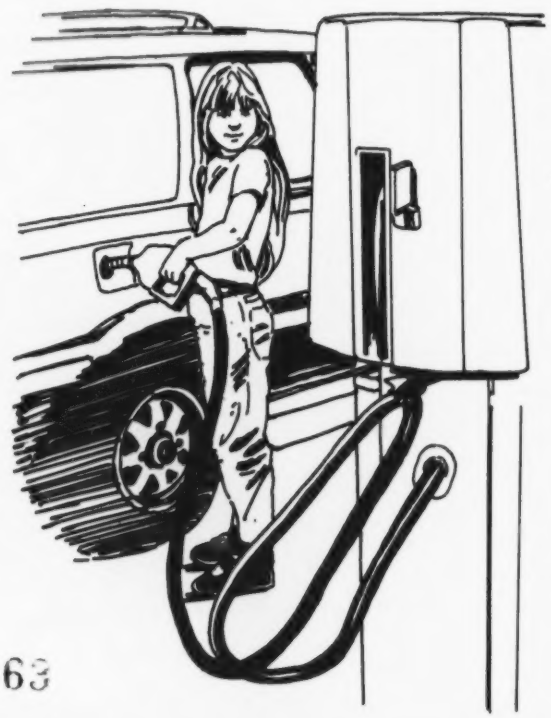
3. John bought 2 new handlebar grips for his A.T.C. Each grip costs $2.39. He also bought some chrome cleaner for $1.89. How much did he spend? _____

4. Mr. Faber wants to buy a new car. The car costs $6800. The salesman is willing to give him $2455 for his old car. How much money will Mr. Faber have to spend on the new car? _____

5. A tractor rig can hold 125 gallons of gas. Presently there are 34 gallons of gas in the tank. How much more gas will it take to fill the tank? _____

6. Jill's mom buys an average of $15 of gas per week. How much does she spend each month? _____

7. 2345 cars drove past Mr. Tomey's service station last month and 2876 cars drove by this month. How many cars drove by the station in the two months? _____



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Answer Key

UNIT ONE: THE CORNER STORE

Page 1: Answers will vary.

Page 2:
1. money
2. goods
3. c, b, a, e, f, d
4. count money, $3.15
5. price tag, $.79
6. a. receive change
   b. owe additional money

Page 3: Answers will vary.

Page 4:
1. 15
2. Answers will vary.
3. 4
4. Answers will vary.
5. 4
6. Answers will vary.

Page 5:
1. 9 pennies
2. 3 pennies
3. 12 pennies
4. 3 pennies
5. 3 times
6. 11 pennies
7. 12 nickels
8. 3 pennies
9. 3 pennies
10. 12 pennies

Page 6:
1. Answers might include: Sammy received 2 pennies, 2 dimes and a quarter. The cost of the candy bar was 53 cents. Sammy gave Mr. Clark $1.00.

2. a. 1 quarter and 3 pennies
   b. 1 nickel and 2 quarters
   c. 4 pennies, 1 nickel and 1 quarter

Page 7: Answers will vary.

Page 8: Answers will vary.

Page 9:
1. 5 days
2. 29,524 lemons
3. 16 days
4. Answers will vary.
5. Answers will vary.

Page 10:
1. a. 48 oz. for $ .96
   b. 5 pounds for $4.00
   c. 5 cups for $6.00
   d. 36 slices for $1.00
2. Greatest quantity for least amount of money

Page 11: Answers will vary.

Page 12: S = stripe, C = cake, P = plain, M = margarine, D = dots, L = loaf, Z = zigzag, B = bread

1.

SB	ZM	DL	PC
PB	SM	ZL	DC
DB	PM	SL	ZC
ZB	DM	PL	SC

2.

ZB	DB	PB	SB
DM	PM	SM	ZM
PL	SL	ZL	DL
SC	ZC	DC	PC

3.

SB	ZM	PL	DC
ZL	SC	DB	PM
DM	PB	ZC	SL
PC	DL	SM	ZB

4.

ZB	PC	SM	DL
SL	DM	ZC	PB
DC	SB	PL	ZM
PM	ZL	DB	SC

Page 13:
1. $4.32
2. $1.44
3. $ .21
4. 12 oz.
5. $ .47
6. $ .16
7. $1.50
8. $5.25
9. Problems will vary.

Page 14:
1. $3.24
2. $ .20
3. $ .49
4. $1.00
5. 4 shelves
6. $ .22
7. $7.20
8. $ .89
9. Problems will vary.

UNIT TWO: THE TRACK MEET

Page 15: Answers will vary.

Page 16:
1. How long it took Maria to run.
2. Answers may vary. Maria's progress.
3. Answers will vary. How much is Maria improving?
4. Answers will vary. What is Maria's best race?
5. Questions will vary.

Page 17: Answers will vary.

Page 18: 1. 9 members
2. 81 guests

Page 19: 30 sec. at the start (or finish) line

Page 20: 1 first place, 5 second place, 2 third place.

Page 21: Answers will vary.

Page 22: Answers will vary.

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Page 24: Answers will vary.

Page 25: Answers will vary.

Page 26: Answers will vary.

Page 27:

1. Drifters (Wendy)
2. Lightning Express (Johnny)
3. Striders (Maria)
4. Speed Demons (Jarvis)

Page 28:

1. 325 seconds or 5 minutes 25 seconds
2. 38 feet
3. 12 points
4. 1.8 feet
5. 16 seconds
6. 437 spectators
7. 6 combinations

Page 29:

1. .5 seconds
2. 44 seconds
3. 6 buses
4. 7 combinations
5. 16 points
6. 4.6 inches
7. 15 bottles

UNIT THREE: THE CONSTRUCTION SITE

Page 30: Answers will vary.

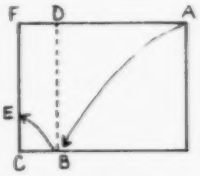
Page 31: Answers will vary.

Page 32: Answers will vary.

Page 33:

1. 15 ways 2. 8 squares 3. 15'x15'

4. 1. Fold point A to point B.
   2. Cut from B to D. The distance from B to C is 2½" (11-8½)
   3. Fold corner B to point E.
   4. The distance from E to F is 6" (8½-2½).



Page 34: 135 houses

Page 35: 1. Givens: 6200 bricks in each house; 125 new houses; Solution: 775,000 bricks. 2. Givens: Carl is 28. Javier has been laying bricks for 4 years. He started when he was 18. Solution: Carl is 28 years old. 3. Givens: Javier can lay 300 bricks a day. Carl can lay 45 bricks per hour. Both work 6 hours per day. Each house has 6200 bricks. Solution: 10.9 days. 4. Givens: It takes 10.9 days to build one home. There are 125 new homes. Solution: 1362.5 days

Page 36: triangles, squares, pentagons, hexagons, octagons

Page 37: Answers will vary. All regular polygon bases will yield domes.

Page 38: Answers will vary.

Page 39: 1. yes 2. yes

Page 40: Answers will vary.

Page 41: Answers will vary. It helps to be first to leave a multiple of 4 sticks. Always reduce the number of sticks by 4.

Page 42: 1. 83 nails 2. 8 gal. 3. 8 ft. 4. $28,000 5. 1035 hours 6. 250 hours 7. 4 weeks

Page 43: 1. 94 houses 2. 154 houses 3. 14 people 4. 1380 doors 5. 2 days 6. 6 sheets 7. $5885

UNIT FOUR: THE SERVICE STATION

Page 44: Answers will vary.

Page 45: Answers will vary.

Page 46: Answers will vary.

Page 47: 1. $40 2. 6 people

Page 48: 1. Answers will vary. 2. 60 mph

Page 49:

1.

Number of Terminals	2	3	4	5	6
Number of Ways to Wire Terminals	1	3	6	10	15

2. 10 terminals = 45 connections; 30 terminals = 435 connections

Page 50: 1. Two million, eight hundred fifty-five thousand, two hundred sixty-three 2. Forty-five million, eight hundred sixty-six thousand, five hundred 3. Three hundred forty-five million, eight hundred thousand, five 4. One hundred twenty-four thousand, six hundred forty 5. 18,432 6. 625,705,826

Page 51: 1. Answers will vary. The car will use lots of gas. 2. a. $80 b. $20 c. $10

Page 52: 1. Descriptions will vary. Drive 2 blocks east on Oak Ave. to Second St. Turn right and go 1 block to Maple Ave. Turn left and drive 1/2 block beyond the first stoplight. 2. Answers will vary.

Page 53: Answers will vary.

Page 54: Answers will vary.

Page 55: 1. The tanks are the same. 2. In the first situation, there are different prices for the same service. In the second situation, a total price for different services is described.

Page 56: 1. 348 miles 2. $405 3. 83 afternoons 4. $13 5. 46,276 miles 6. $8.56 7. 2650 gallons

Page 57: 1. 261 miles 2. 32¢ 3. $6.67 4. $4345 5. 91 gallons 6. $60 7. 5221 cars

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	SITUATIONS, STRATEGIES AND SOLUTIONS EMPHASIZED IN THIS BOOK	UNIT ONE PAGE	UNIT TWO PAGE	UNIT THREE PAGE	UNIT FOUR PAGE
Interpreting the Context	Retailing	2			
	Making change	6			
	Profiting	9			
	Measuring performance		16		
	Comparing performance		21		
	Recording performance		25		
	Planning and building			31,37,38	
	Creating with shapes			36,39	
	Recording everyday math	1	15	30	44
	Asking math questions				45
	Determining miles per gallon				51
	Giving directions				52
Extending Knowledge	Conducting an interview	3	17	32	46
	Taking inventory	7			
	Making an inquiry	10			
	Inventing measurable performances		22,26		
	Collecting field data	11			53
	Using tools				54
	Reading large numbers				50
Developing Strategies	Simplifying problems	4			
	Using manipulatives	5,12			
	Exploring and discovering	6,8		41	
	Recognizing patterns	10	18		49
	Guessing and testing		20		
	Thinking logically		27		55
	Drawing pictures and diagrams			33	
	Isolating "wants" and "givens"			35	
	Drawing to scale			40	
	Working backwards				47
Finding Solutions	Group problem solving	10	19,23,24	34	48
	Word problems (pretest/posttest)	13,14	28,29	42,43	56,57

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